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A VEGETATION MAP OF NORTH AMERICA

J. W. HARSHBERGER. **[Wall map of the] Vegetation of North America.** Scale, 1: 6,170,000. Rand, McNally & Co., Chicago and New York, 1920. $8.00 with wood rod at top and bottom.

The present wall map of the vegetation of North America, prepared by Dr. J. W. Harshberger of the University of Pennsylvania, is suitable for high school and college use and is of interest to all students of plant geography and ecology. The colors and conventions used for the various areas are distinctive, and the mechanical execution of the map is very satisfactory. The author has been successful, in most portions of the map, in mediating between the coarse outlines necessary in a wall map and the accuracy that is necessary in being faithful to the facts. The absence of all political boundaries makes it very difficult, however, to locate specific areas or the lines separating different vegetations.

Twenty-nine types of vegetation are delineated: 8 purely coniferous forest, 4 partially coniferous forest, 4 deciduous forest, 3 sub-tropical and transition types of forest, 2 grassland, 4 desert, and 4 swamp, marsh, and arctic treeless regions. The designations of the various areas are partly in purely botanical terms and partly in terms of the botanical characteristics in conjunction with the geographical location of the areas. In two cases—"Vegetation of San Joaquin and Sacramento Valleys" and "Vegetation and Forests of the Pacific Coast Ranges"—no hint is given as to the character of the vegetations involved. It is not clear what criteria have been used in distinguishing "Tundra and Barren Lands" from "Treeless Regions (above tree limit)." It is doubtful whether the distinguishing features of the "Coniferous Forests of the Northern Rocky Mountains" and the "Coniferous Forests and Vegetation of the Southern Rocky Mountains" are as great as those used in differentiating the other coniferous areas. The distinction involved here is largely a floristic rather than a vegetational one, as is also the case with respect to the characterization of the Edwards Plateau forest of Texas as a "meeting place for plants of Atlantic Coast, Rocky Mountains, and Mexico." The demarcation between the coniferous forests of the southern Rocky Mountains and the sub-temperate hardwood forests of the eastern and western Mexican Cordilleras has been made too far to the north, so far as purely vegetational characteristics are concerned. Much of the area designated as "Deciduous Swamp Forests of the Lower Mississippi Basin" is actually marsh land, occupying a territory of considerable size.

Certain areas of deciduous forests in the highlands of southern Mexico have unfortunately been combined with the very dissimilar vegetations of the eastern and western coasts of Mexico and with the so-called chaparral of southern Texas, and the whole is so designated in the legend as to give the impression that chaparral is synonymous with deciduous forest.

While it is always easy to criticize specific details of a map of this character, it is necessary to bear in mind the very great difficulties involved in its preparation, both with respect to sources of information and the interpretation of very complex plant communities. Viewed as a whole, and with due regard to the difficulties of the task, Professor Harshberger's map is a very creditable piece of work. He has escaped two of the leading pitfalls into which authors of vegetational maps are likely to fall: he has based his areas on purely botanical criteria, without regard to climate, soil, topography, or other causal conditions; and he has used vegetational characteristics in distinguishing his areas, with a minimum of reference to the unrelated floristic features.

FORREST SHREVE

SOLAR RADIATION AND THE WEATHER

H. H. CLAYTON. **Variation in Solar Radiation and the Weather.** Introductory note by C. G. Abbot. vi and 53 pp.; maps, diagrs. *Smithsonian Misc. Colls.*, Vol. 71, No. 3. Washington, D. C., 1920.

In the effort to explain the puzzling complexity of changes of climate in the geologic past, variations in the intensity of solar radiation were long ago appealed to as a probable cause. Recently several writers have brought forward a similar explanation in connection with short-period oscillations or fluctuations in various meteorological conditions of the present time. It has, however, remained for Mr. H. H. Clayton, chief of the forecast division of the Argentine Weather Service, to make an intensive study of the relations between solar radiation values and succeeding weather conditions with a view to the improvement and extension of the daily weather forecasts. Mr. Clayton's investigation is therefore distinctly pioneer work, of the greatest practical scientific interest and value. As Dr. C. G. Abbot says in the introduction to the present monograph, the conclusion reached "is of a very revolutionary character and deserves the most careful attention of meteorologists and students of solar physics"

(p. iii), and again, if the conclusions "be true, we stand . . . . on the threshold of a very important research in meteorology" (p. v).

The daily solar measurements made at Calama, Chile, by the Smithsonian Institution, were transmitted to Buenos Aires, at first by mail and then by cable, and were used for forecasting purposes from early December, 1918. By the correlation method, as well as by the method of direct comparison, Mr. Clayton compared all the observations of solar radiation made by the Smithsonian Institution, both at Calama and at Mt. Wilson, with the temperatures and rainfall of Argentina. Further comparisons were also made, in an earlier paper, between the weather in remote parts of the world and the Mt. Wilson observations. It is impossible, in a brief note such as this, to follow Mr. Clayton's very careful and painstaking research in detail. Briefly, his main conclusion is (1) "that if there were no variation in solar radiation the atmospheric motions would establish a stable system with exchanges of air between equator and pole and between ocean and land in which the only variations would be daily and annual changes set in operation by the relative motions of the earth and sun; (2) the existing abnormal changes which we call weather have their origin chiefly, if not entirely, in the variation of solar radiation." During the summer, high values of solar radiation are followed, a few days later, by high temperatures at Buenos Aires, and decreases in solar radiation are followed by rain. In winter, the relation is different, increases of solar intensity being followed three to five days later by rising pressure and cooler weather in Argentina. A detailed study of the lengths of the periods of solar radiation shows that "there is a distinct tendency to form periods around certain lengths," e.g. 3.5 to 3.7 days, 4.9 to 5.3, etc., up to 30 to 34 days. At Buenos Aires the ratio of change of temperature to solar change at the time of maximum solar activity was found, from several years' averages, to be 1.4°C. for each change of 1 per cent of solar radiation. The extreme solar values range about 6 per cent on either side of the mean. Hence departures of about 8.5°C. from the normal at Buenos Aires might result from this cause. Maps are given showing the rainfall on five successive days during which there was a complete daily solar record. On the average, the rainfall follows a solar decrease after about three days in southern Buenos Aires and the Pampa, and after about five days from Corrientes to Tucumán.

The whole investigation is one of the most striking, and is surely one of the most important, which has been brought to the attention of meteorologists in recent years. For about three decades Mr. Clayton has been devoting himself largely to the question of the improvement of daily weather forecasts. With the help of the Smithsonian Institution he has now been able to strike out on a new path, and his conclusions seem destined to revolutionize the whole business of forecasting. Mr. Clayton is not prone to make statements for which he has no good and sufficient scientific basis. Meteorologists, and scientific men generally, may therefore well pay attention to the following: "These studies, it is believed, will permit the prediction of the weather with a fair degree of accuracy for much longer intervals in advance than three days and may perhaps extend them to weeks or years" (p. 52). R. DeC. Ward

A New Standard Manual of Meteorology

Napier Shaw. **Manual of Meteorology. Part IV: The Relation of the Wind to the Distribution of Barometric Pressure.** xvi and 166 pp., maps, diagrs., ills., index. *M[eterol]. O[ffice Publ. No]. 234,* London, 1919. 12s., 6d. 10 x 7 inches.

This fourth part of what doubtless, when complete, will be for a few years the leading reference book on meteorology is a direct outcome of the war. Quite early in the struggle it began to dawn upon those charged with offensive and defensive operations that some knowledge of the structure of the atmosphere was desirable and might even prove helpful. When evidence began to accumulate that the enemy, not only in his offensive air campaign but also in the execution of land and sea operations, had his meteorologists at work and was gaining much thereby, there came hurried calls upon the British Meteorological Office for data about the winds, at the surface, at moderate elevations, and at the great heights. The naval, military, and air services sent in their questions; and one may well imagine that Sir Napier Shaw and his staff had their hands full. It is a fact that, before the war, surface winds only were considered in gunnery and that upper air conditions were unnoticed. This is only one illustration of the sudden awakening which came in 1914 and 1915.

The present volume was issued in advance of Parts I, II, and III because there was much material at the Meteorological Office which had not heretofore been collected and gathered up in available form. Part I, when it appears, will attempt a general survey of the globe based largely on the work of Teisserenc de Bort and Hildebrandsson. Part II will be perhaps the most vital section, dealing with the thermodynamics of moist air; and Part III will formally set forth the dynamics and kinematics which find their application in the problems discussed in Part IV.